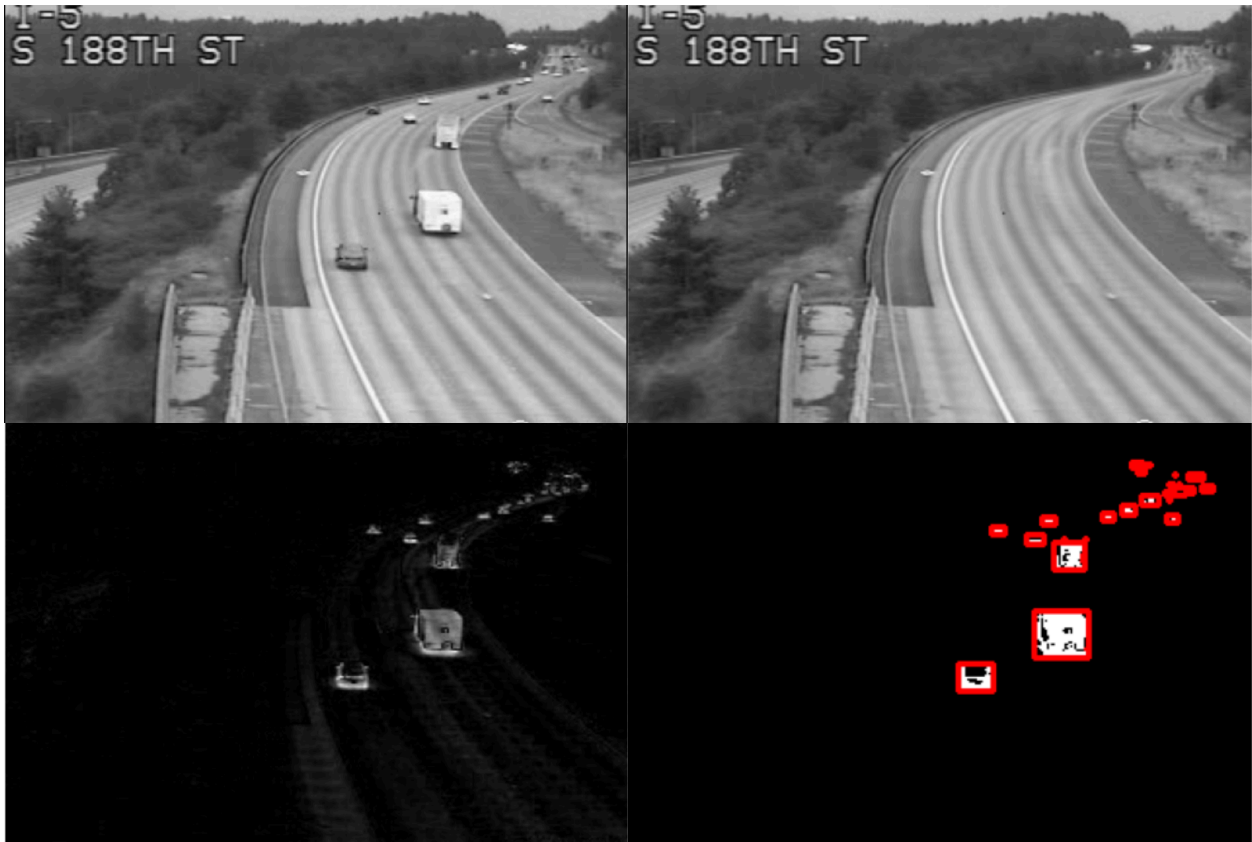


Homework 0: Background Subtraction



This lab focuses on first implementing a background subtraction technique to separate foreground objects (cars) from the background (highway) in a video sequence. Otsu's method is then used to threshold and obtain a binary mask of the foreground. Finally, a bounding box is drawn around each car in the sequence.

Code Explanation

Since the video was given as .zip file containing 50 .jpg frames, I chose to use a for loop to read in each image, perform all necessary computations, and append the final image to a list. The list is then converted to an array and sent to the `show_video` function. I didn't know how to load a sorted list of .jpg files so I prompted ChatGPT to write some code for me. I then edited the code to make it fit my exact situation.

For creating a binary mask using the Otsu threshold, I chose to use `skimage` over `opencv-python` since it contained better documentation and even examples on how to find the Otsu threshold. The bounding boxes drawn at the end were done using both `skimage` and `opencv-python`.

Discussion Questions

- 1. When you compute the average image (background image), the cars have disappeared -- why?**

In the provided sequence of images, the cars are in constant motion while the highway in the background stays still. Since each car occupies any given pixel location for only a small fraction of the total frames, its contribution to the average intensity at that pixel location is minimal compared to the background's contribution.

- 2. How well does the technique work to separate the cars from the background? Where does it fail and why?**

This technique works well under ideal conditions, but it fails when the cars are not in constant motion. If there is traffic, for example, the cars may begin to blend into the average background image. In the average background image from this lab, a noticeable blur or defect can be seen towards the top of the road, where cars tended to pile up and not move in constant motion.